Combined Heat and Power
Energy Solutions for the 21st Century

The Market Prospects
for
Combined Heat and Power
in the U.S.

February 1, 2000

Washington, D.C.

Keith Davidson

ONSITE SYCOM Energy Corporation

ONSITE SYCOM Energy Corporation

- Largest independent, nationally accredited Energy Service Company (ESCO)
- Full service offering with international presence
- Company origins in cogeneration and on-site power
- Active in distributed generation and combined heat and power

Presentation Outline

- CHP Market Drivers
- CHP Market Potential
- Economic Fundamentals
- Market Barriers
- CHP Application Niches
- Conclusions

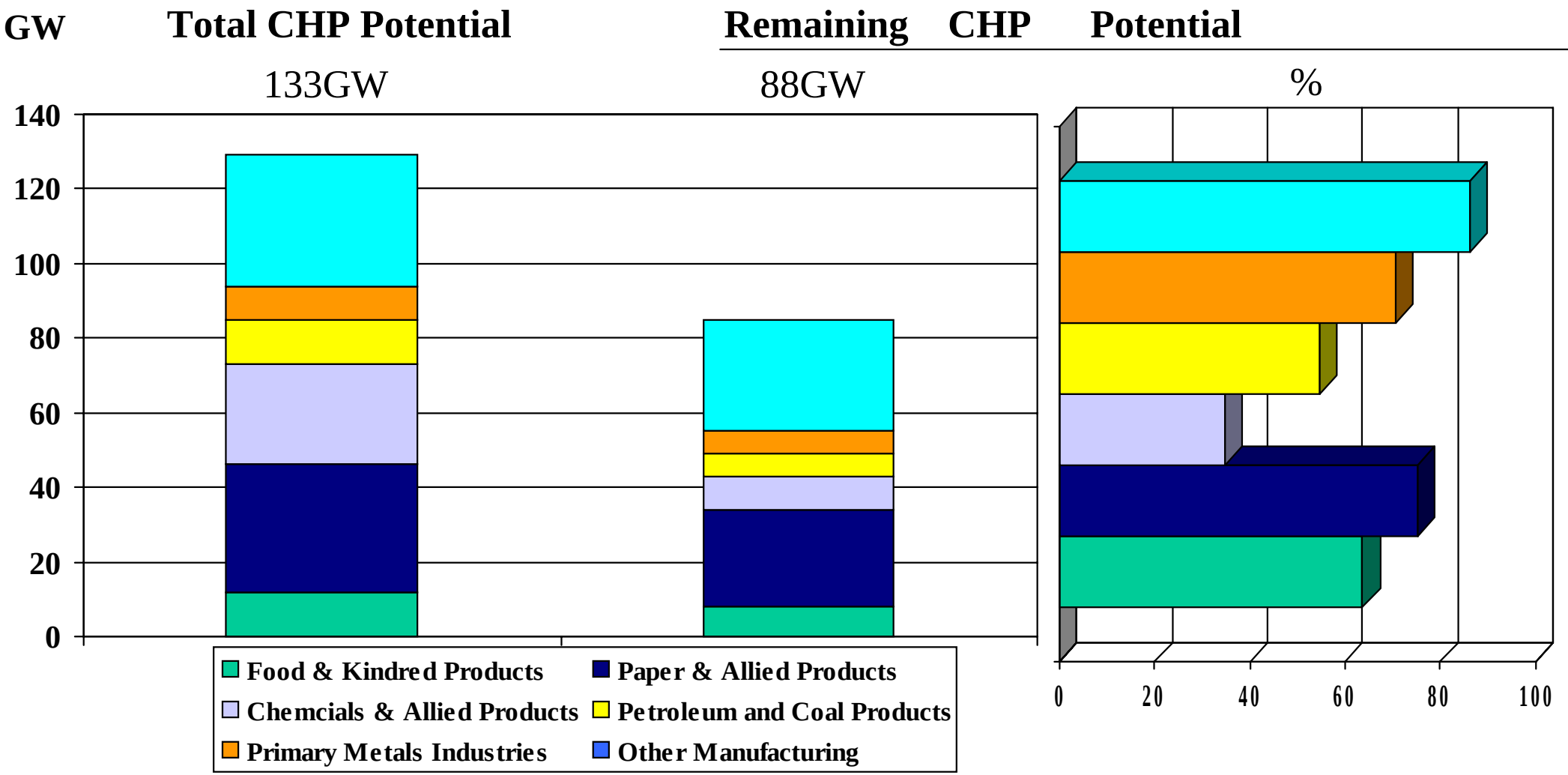
ONSITE SYCOM Energy Corporation

CHP Market Drivers

- Restructuring is opening access to the electric grid system
- Customers have greater awareness of energy costs and options
- Technology improvements enhancing performance & economics
- ESCOs & ESPs opening path to market
- Federal and state government taking action

ONSITE SYCOM Energy Corporation

U.S. Industrial Sector CHP Potential



Potential linked to steam usage

Commercial CHP Potential

100kW - 10MW

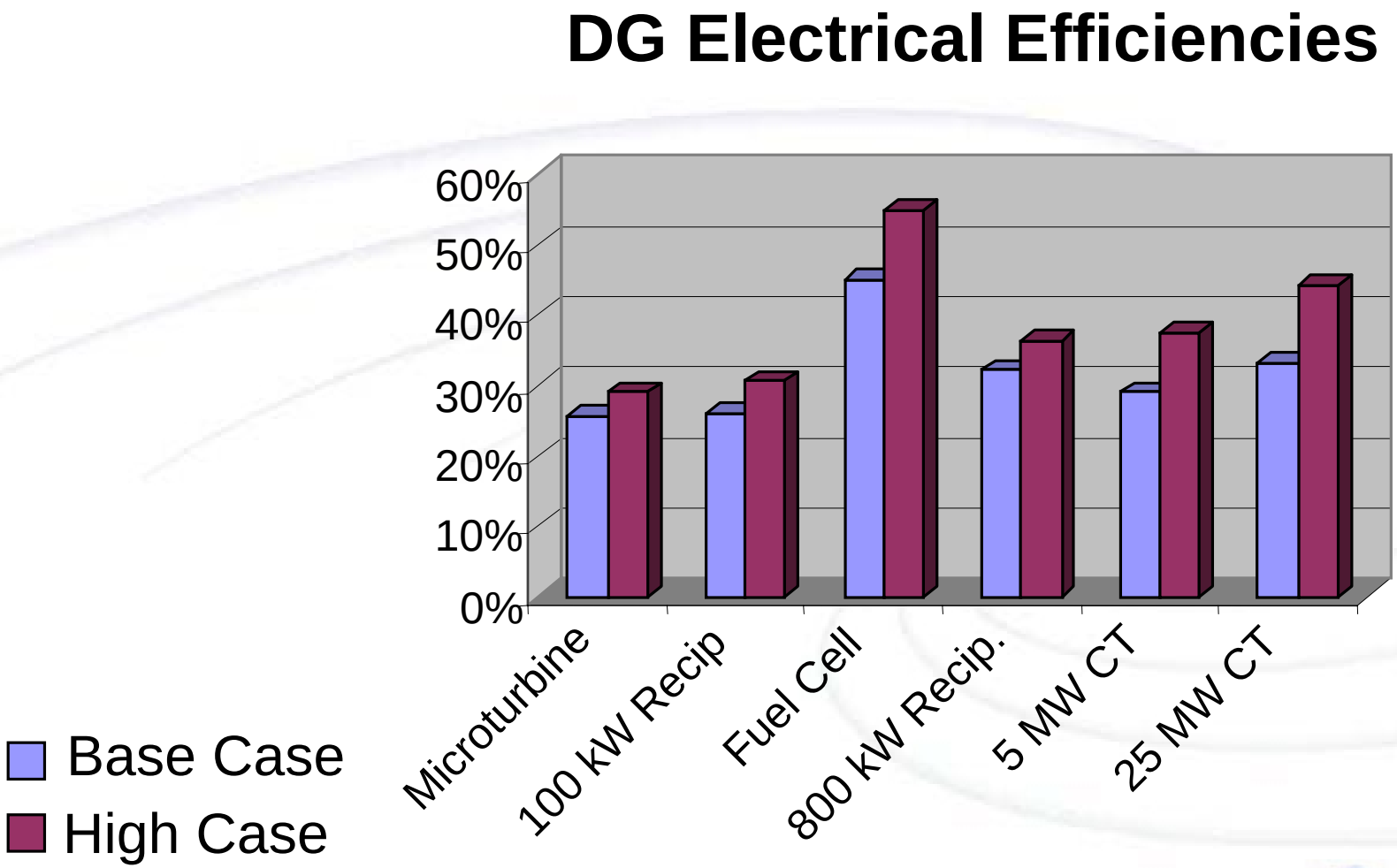
Application	Total Inventory		Economic Potential	
	# Sites	GW	# Sites	GW
Schools	38,466	15.4	33,058	13.2
Colleges/Universities	4,663	3.1	3,772	2.1
Nursing Homes	10,612	4.9	7,664	3.4
Hospitals	7,690	11.4	4,255	5.7
Lodging	11,714	6.6	9,497	4.7
Health/Country Clubs	5,034	2.0	4,196	1.7
Laundries	1,312	0.5	1,127	0.5
Correctional	1,193	0.5	1,035	0.4
Museums	801	0.4	642	0.3
Full Service Restaurants	6,977	2.8	6,026	2.4
Office Buildings	68,816	30.5	53,636	23.7
Apartments	11,700	4.7	9,700	3.9
Total	168,978	82.8	134,608	62.0

Technology Options

	Status	*Size*	*Efficiency (%)*	*Installed Costs ($/kW)*	*O&M Costs ($/kWh)*
Reciprocating Engine	Commercial	20 kW - 20 MW	28 - 45	500 - 1400	0.007-0.02
Combustion Turbine	Commercial	500 kW - 150 MW	21 - 40	600 -900	0.003-0.008
Microturbines	1999	30 kW - 300 kW	20 - 28	600 - 1000	0.003-0.01
Fuel Cells	1996 - 2010	5kW - 3MW	36 - 60	1900 - 3500	0.005-0.010

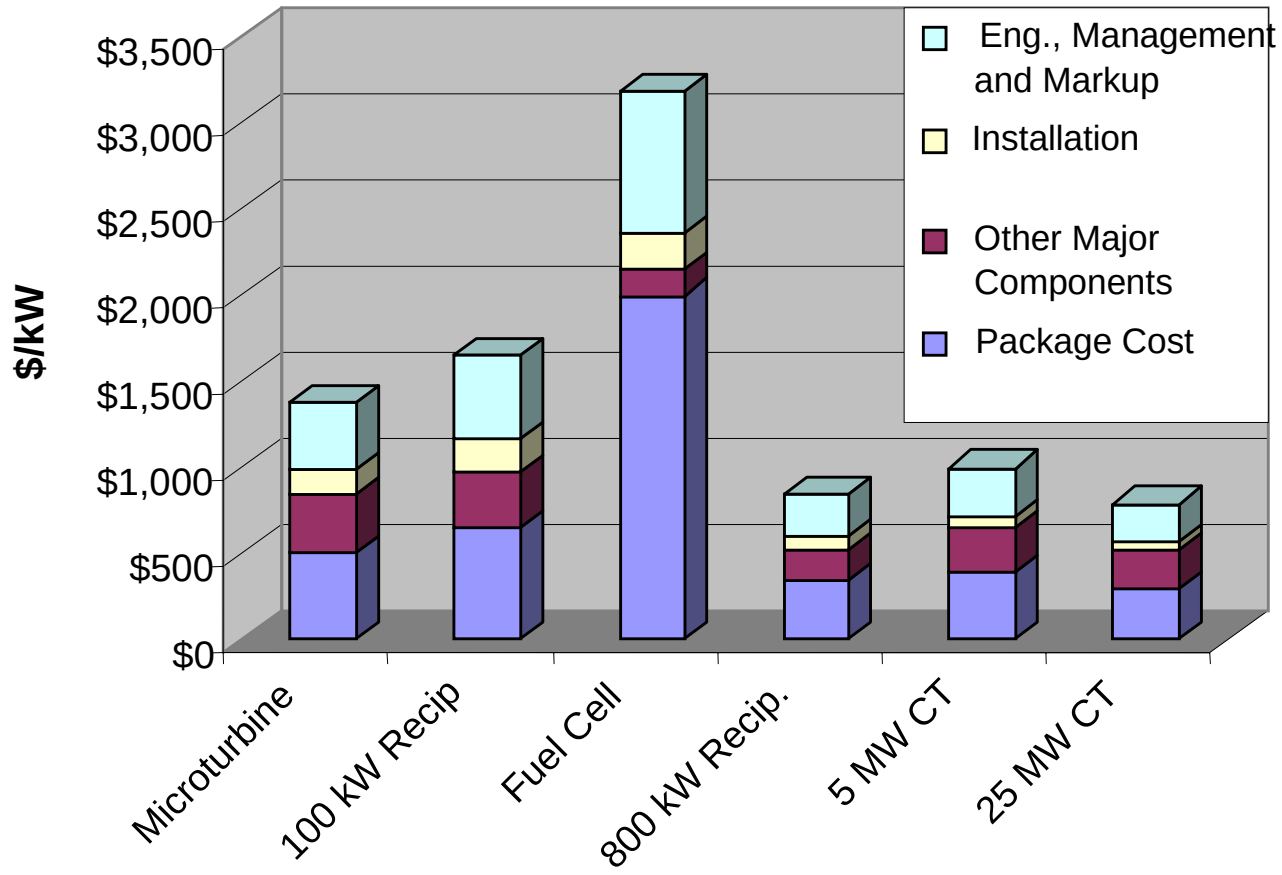
ONSITE SYCOM Energy Corporation

Electrical Efficiencies of DG Technologies



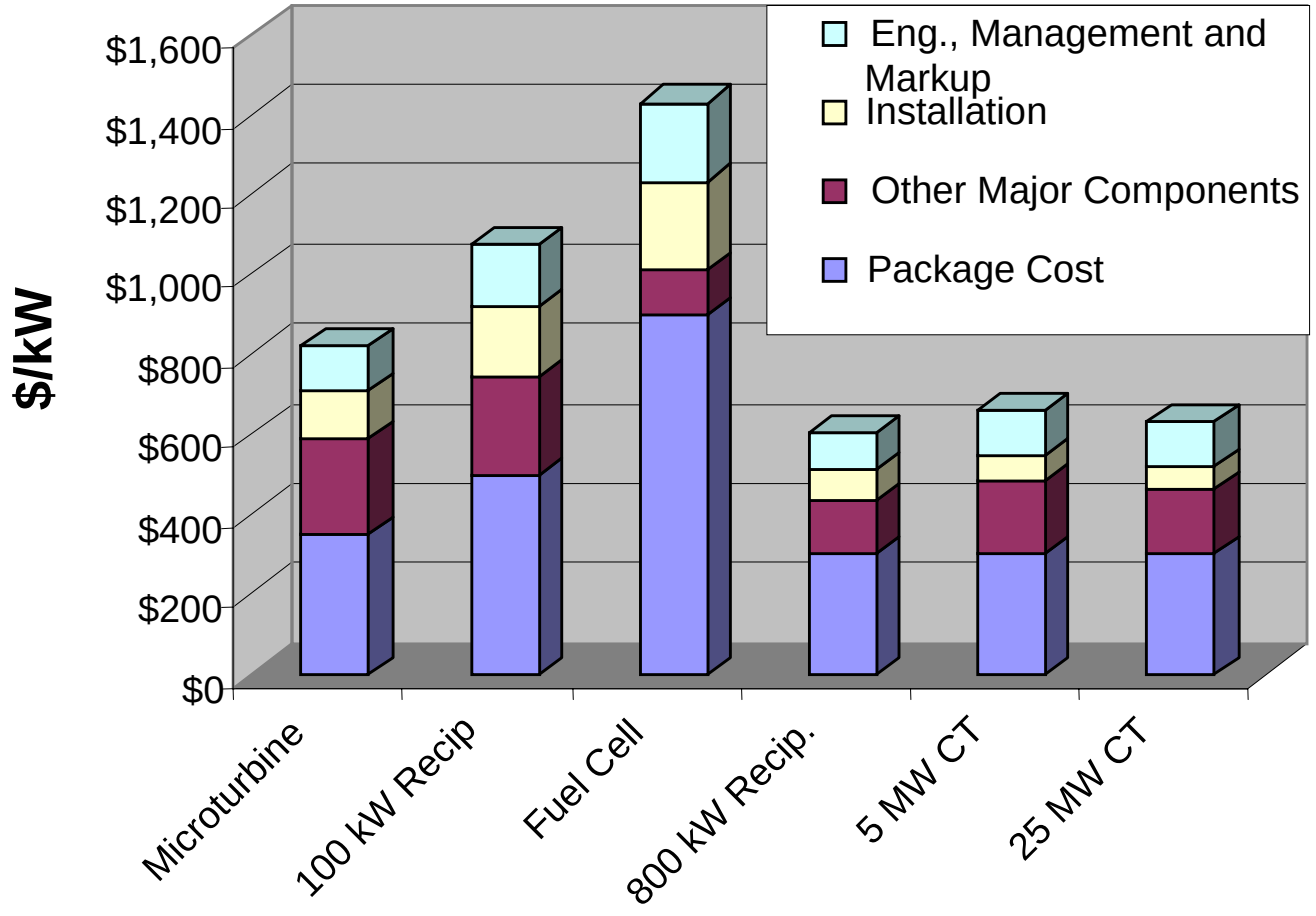
ONSITE SYCOM Energy Corporation

CHP Project Costs



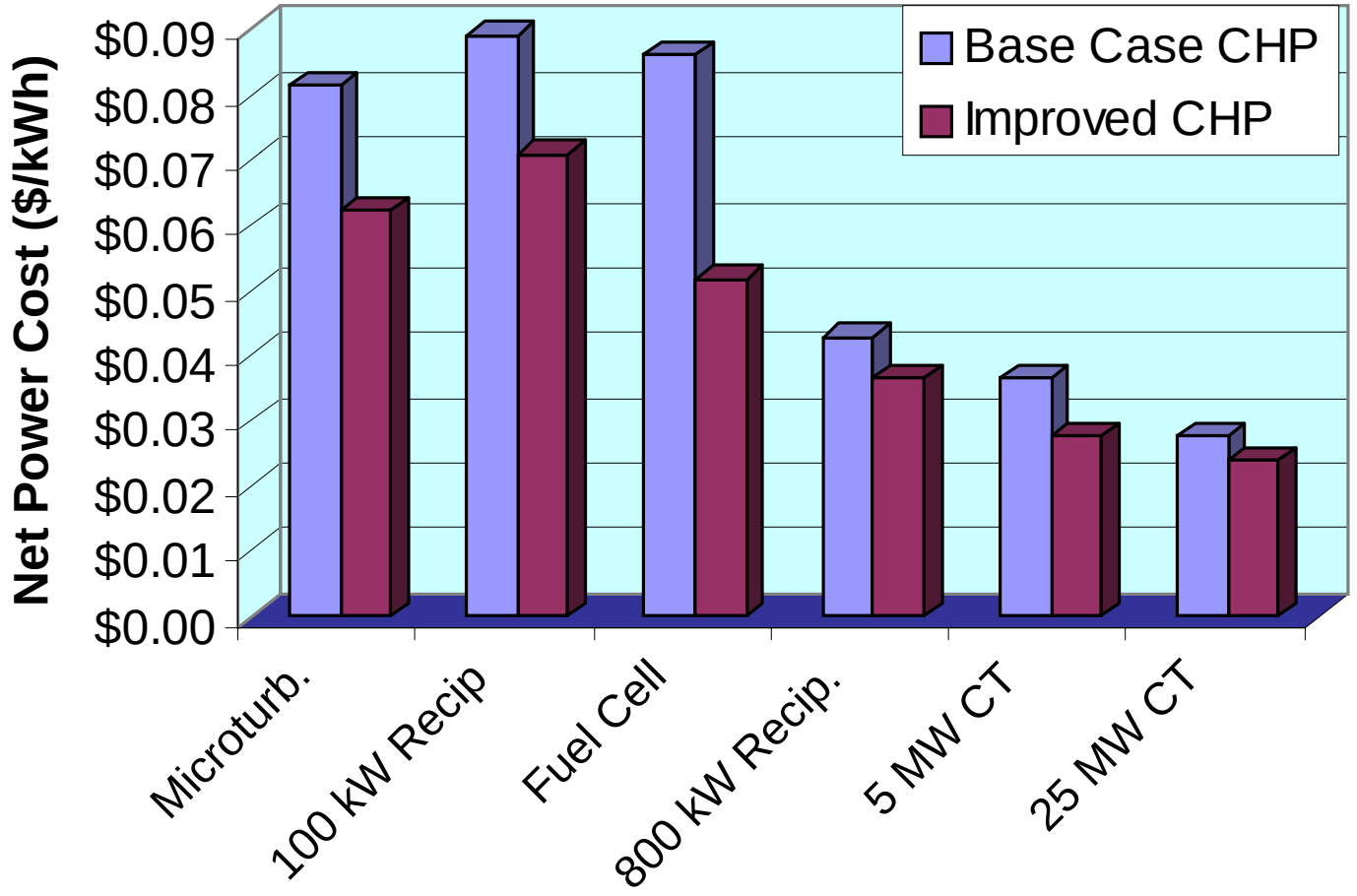
	Microturbine	100 kW Recip	Fuel Cell	800 kW Recip.	5 MW CT	25 MW CT
Package Cost	$500	$650	$2,000	$350	$400	$300
Total Project Cost	$1,375	$1,647	$3,184	$842	$998	$789

Advanced CHP Project Costs



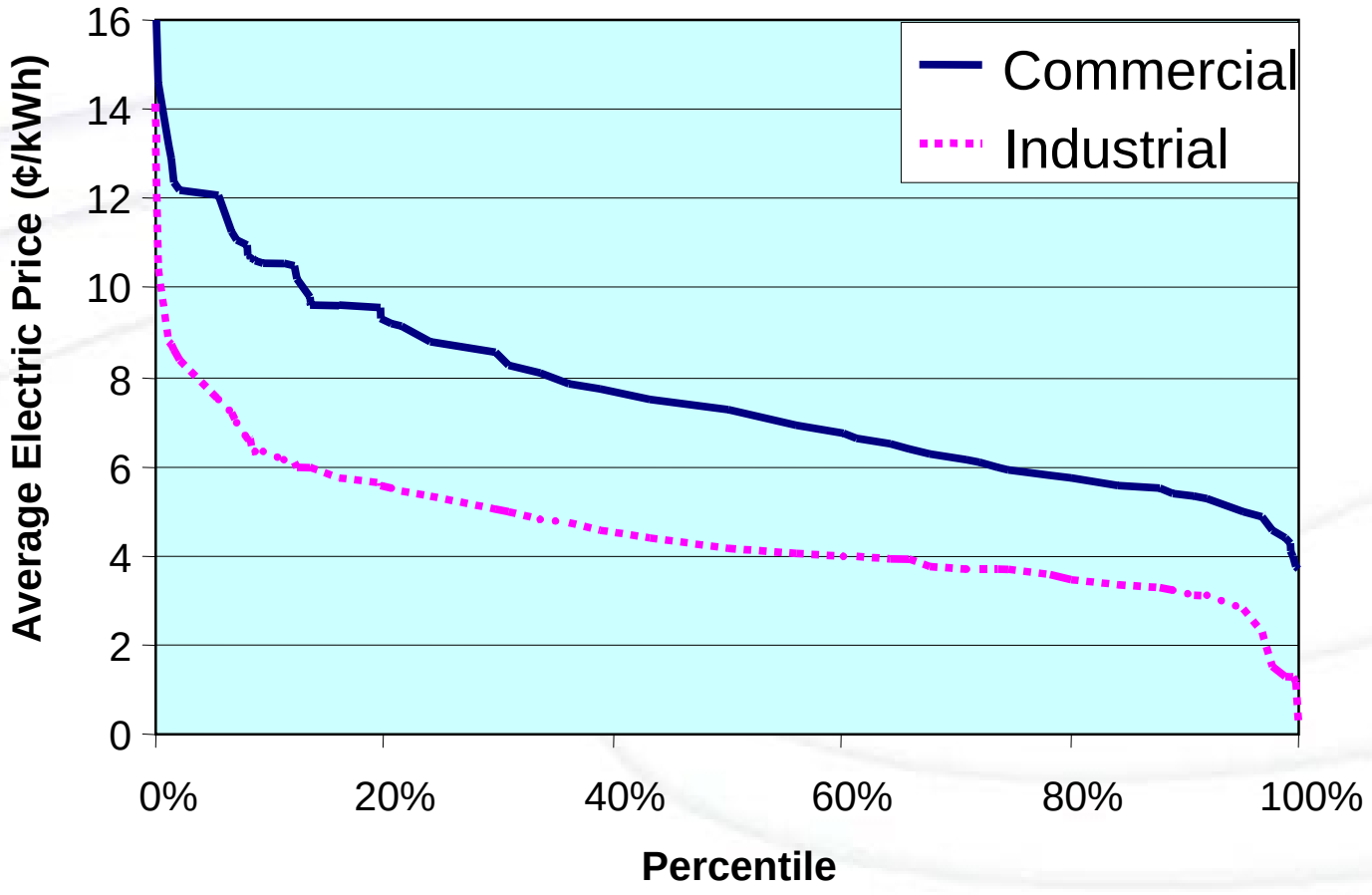
	Microturbine	100 kW Recip	Fuel Cell	800 kW Recip.	5 MW CT	25 MW CT
Package Cost	$350	$500	$900	$300	$300	$300
Total Project Cost	$822	$1,076	$1,430	$601	$659	$632

Comparison of Current Technology CHP with Improved Technology and Streamlined Siting and Installation



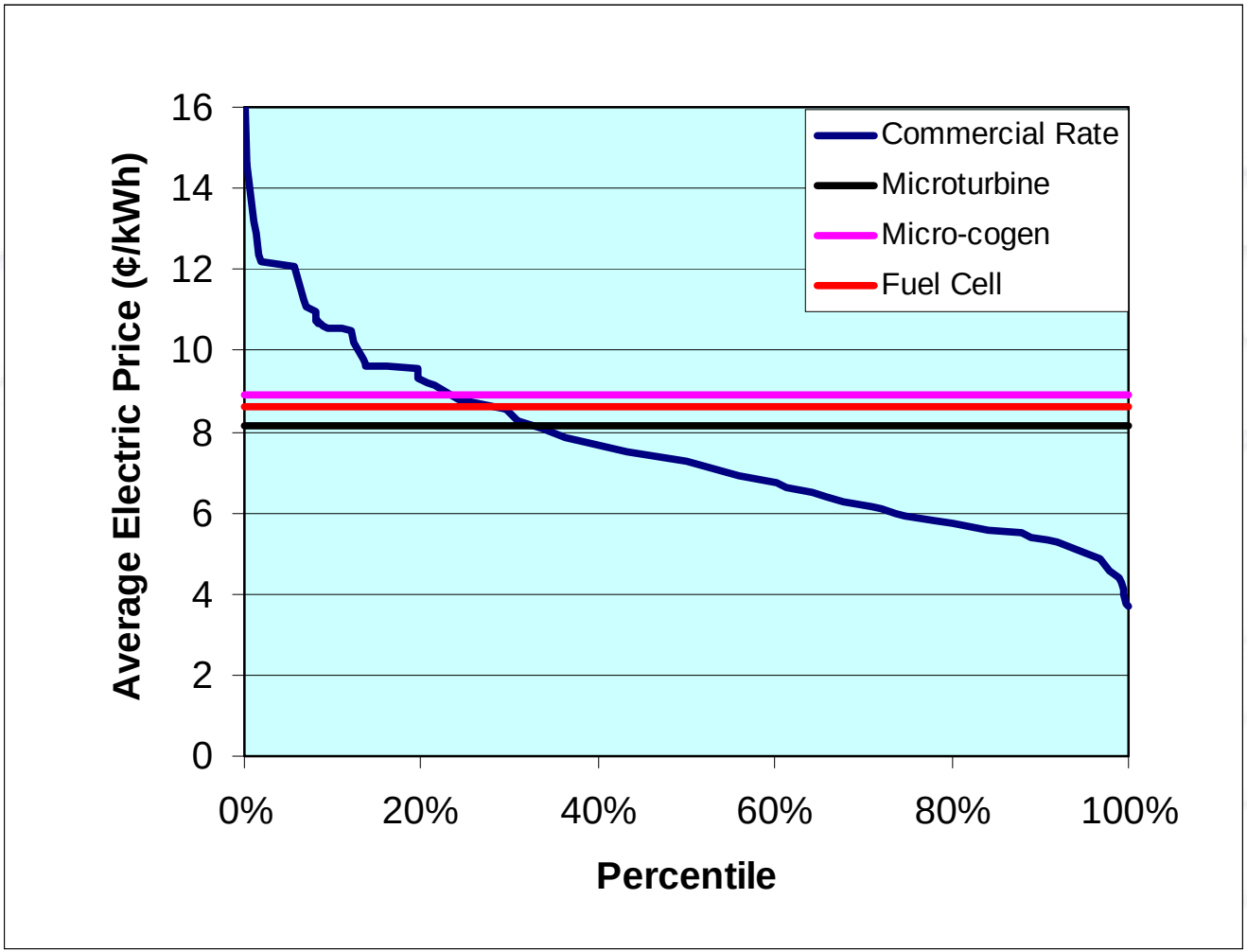
Power Cost	Microturb.	100 kW Recip	Fuel Cell	800 kW Recip.	5 MW CT	25 MW CT
Base Case CHP	$0.082	$0.089	$0.086	$0.043	$0.037	$0.028
Improved CHP	$0.062	$0.071	$0.052	$0.036	$0.028	$0.024

Range of Average Commercial and Industrial Electric Rates in the U.S.



ONSITE SYCOM Energy Corporation

Comparison of **Base Case** Small DG Technology with Current Commercial Electric Rates

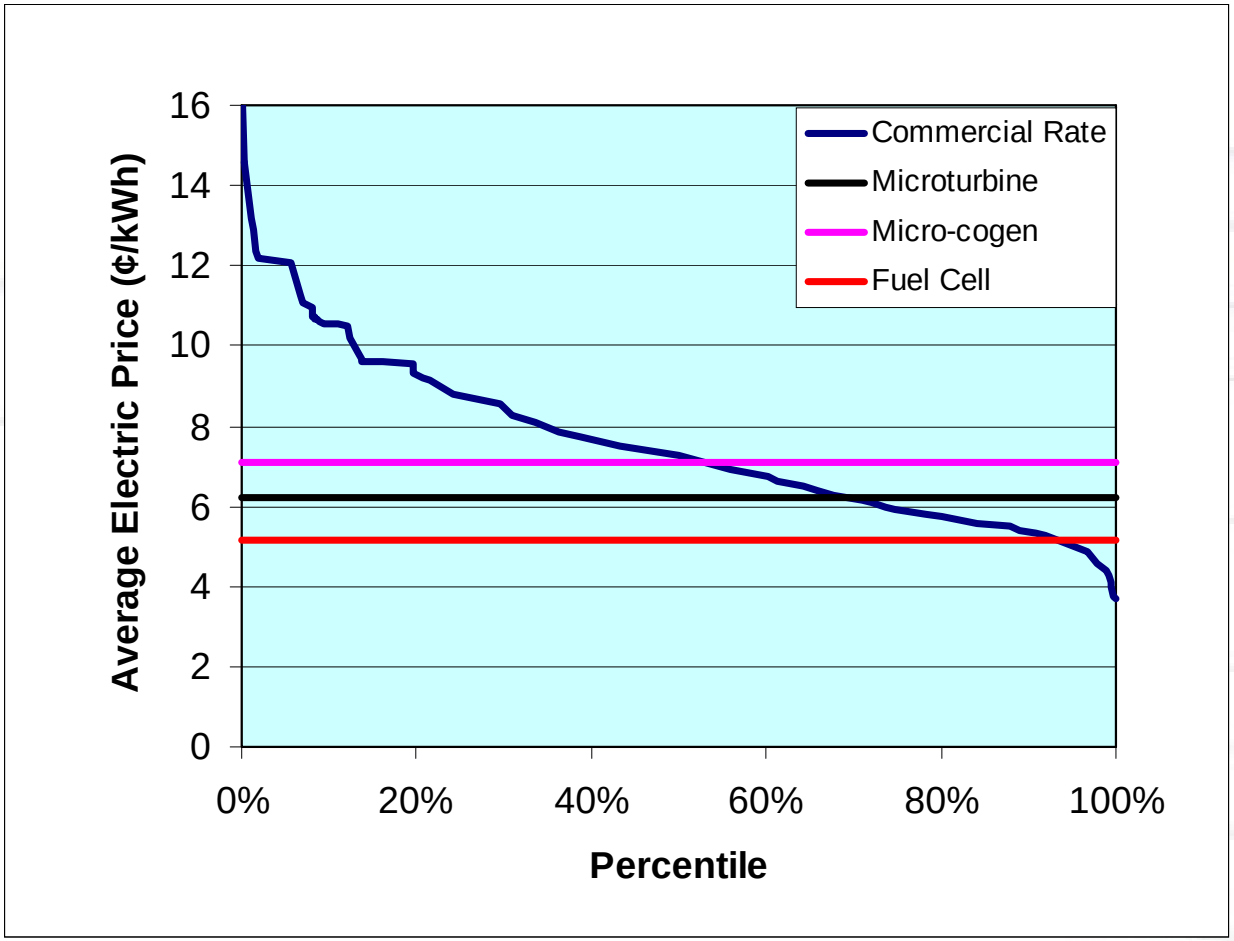


- Fuel Cell power price lower than 31% of the com. market
- Micro-cogen lower than 22% of the market
- Microturbine lower than 28% of the market

Percentile

ONSITE SYCOM Energy Corporation

Comparison of **Improved** Small DG Technology with Current Commercial Electric Rates

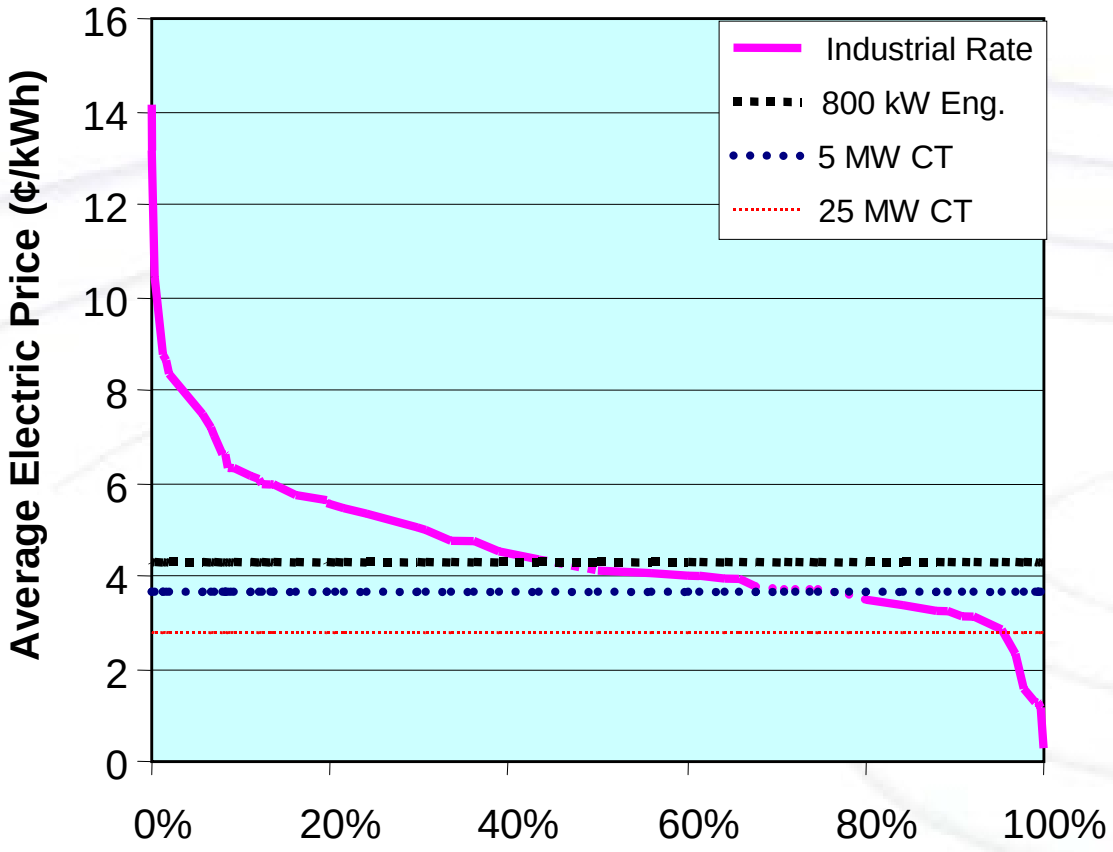


- Fuel Cell Competitiveness increases from 31% to 92% of the market
- Micro-cogen increases comp. range from 22% to 50% of the market
- Microturbine increases from 28% to 68% of the market

Percentile

ONSITE SYCOM Energy Corporation

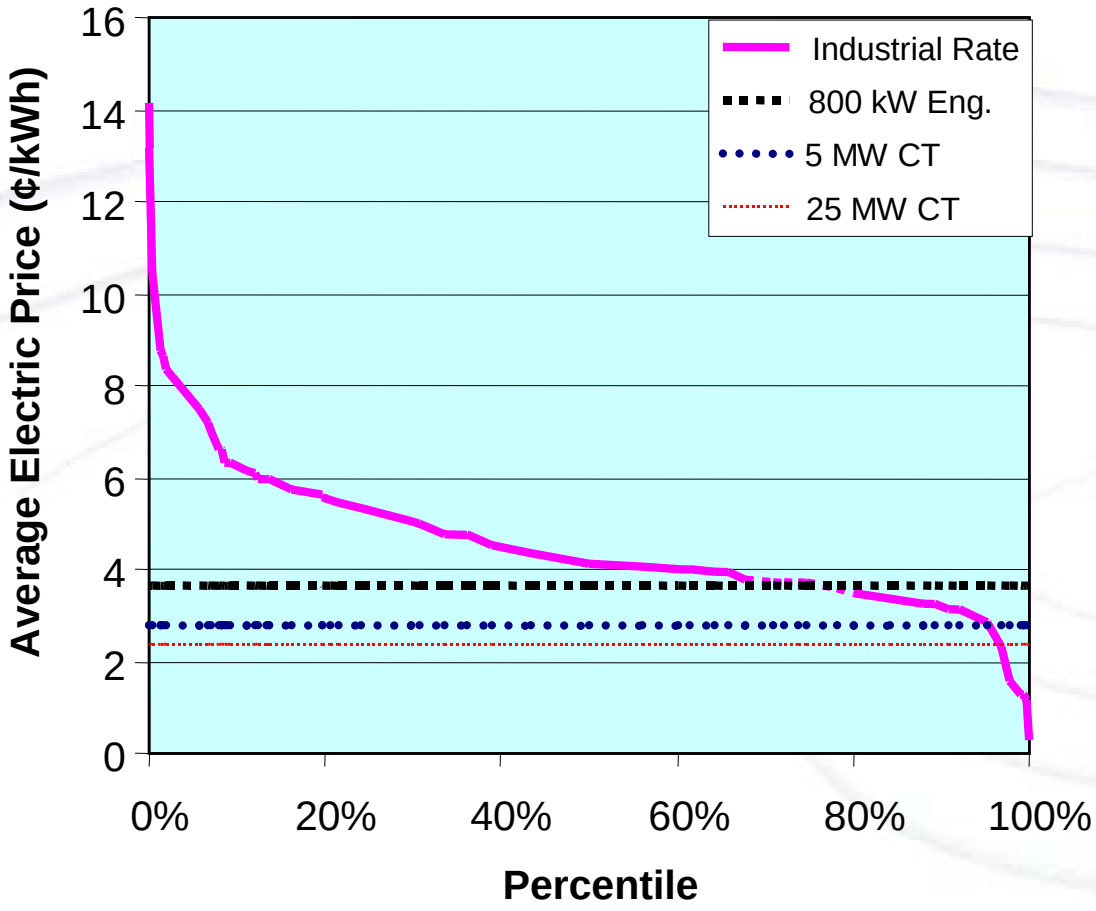
Comparison of **Base Case** Large DG Technology with Current Industrial Electric Rates



- 800 kW Engine CHP has net power price lower than 45% of the ind.mkt.
- 5 MW CT CHP lower than 76% of the market
- 25 MW CT CHP lower than 95% of the market

ONSITE SYCOM Energy Corporation

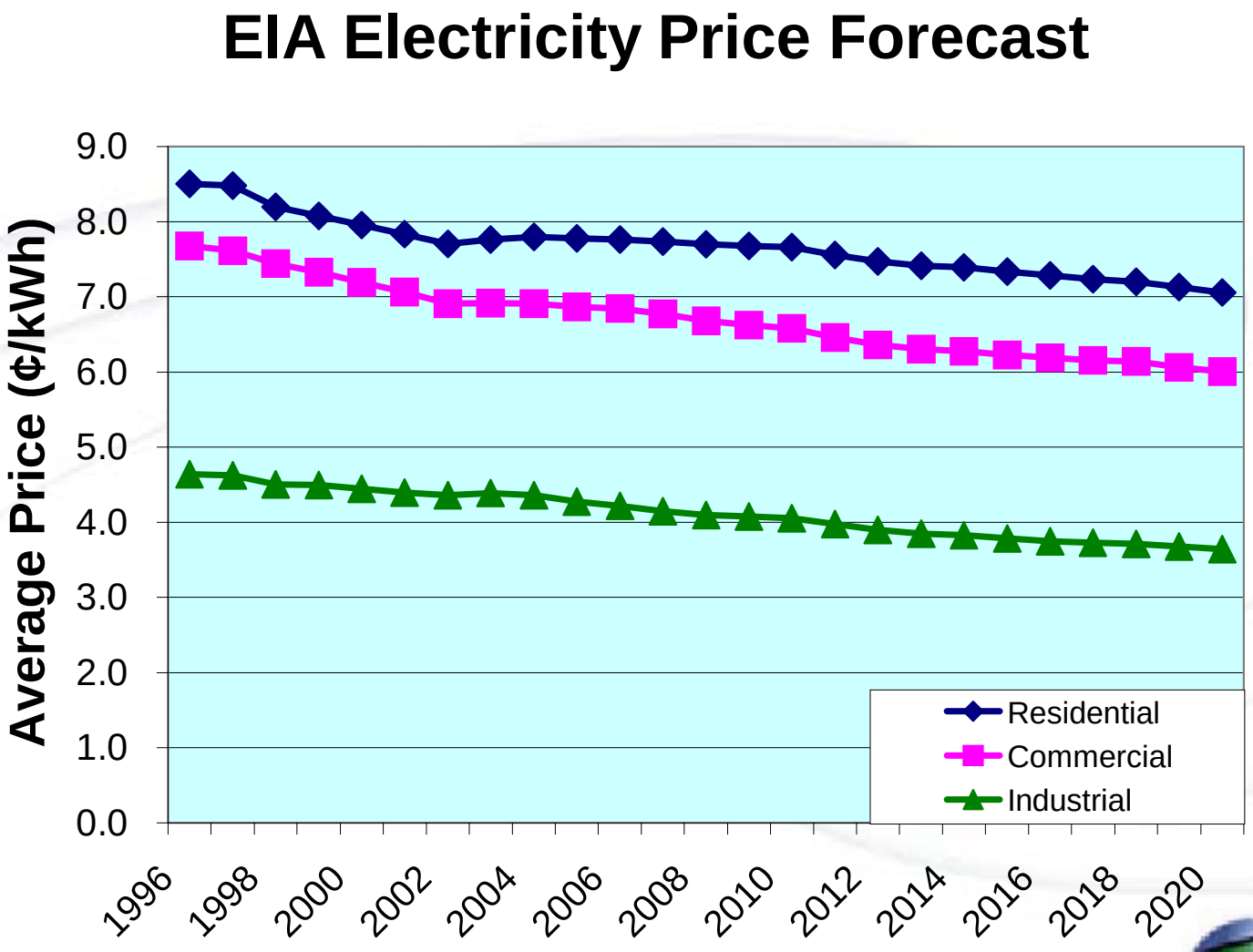
Comparison of **Improved** Large DG Technology with Current Industrial Electric Rates



- 800 kW Eng. CHP competitiveness increases from 45% to 75% of the ind.mkt.
- 5 MW CT CHP increases from 76% to 95% of the market
- 25 MW CT CHP increases from 95% to 97% of the market

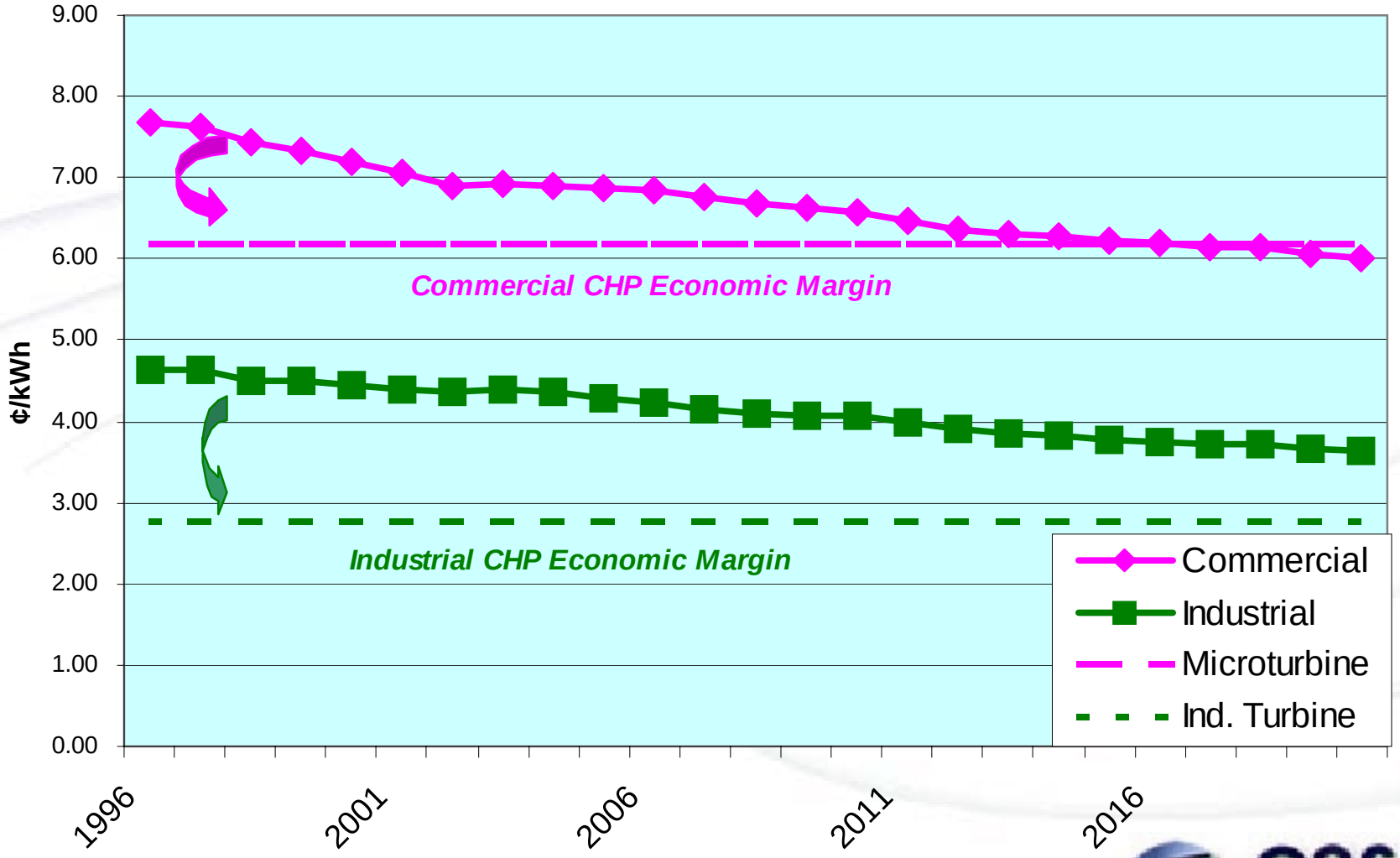
ONSITE SYCOM Energy Corporation

Future Electric Rates Will Be Lower



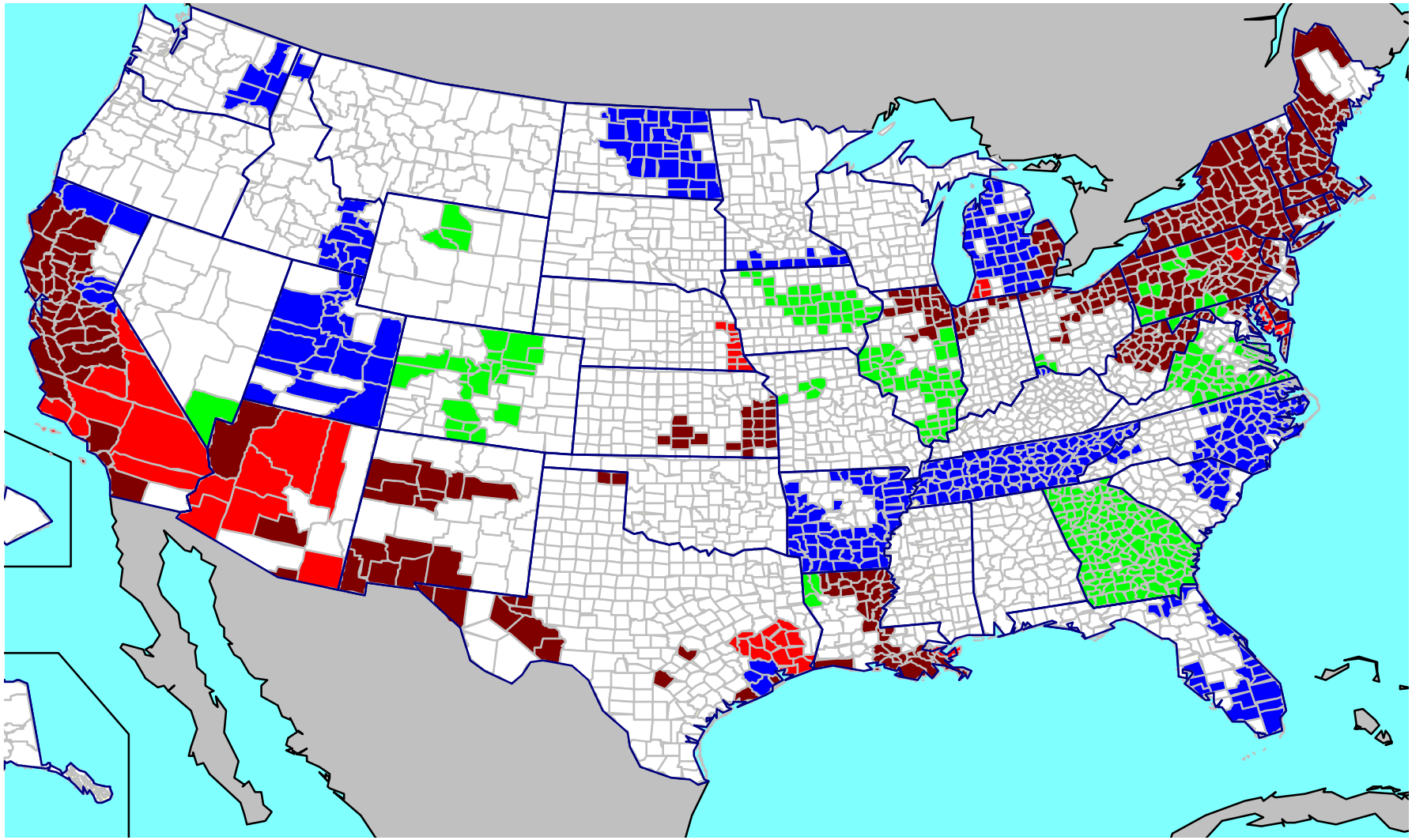
ONSITE SYCOM Energy Corporation

Economic Margins for CHP Will Remain: Comparison to National Average Prices



ONSITE SYCOM Energy Corporation

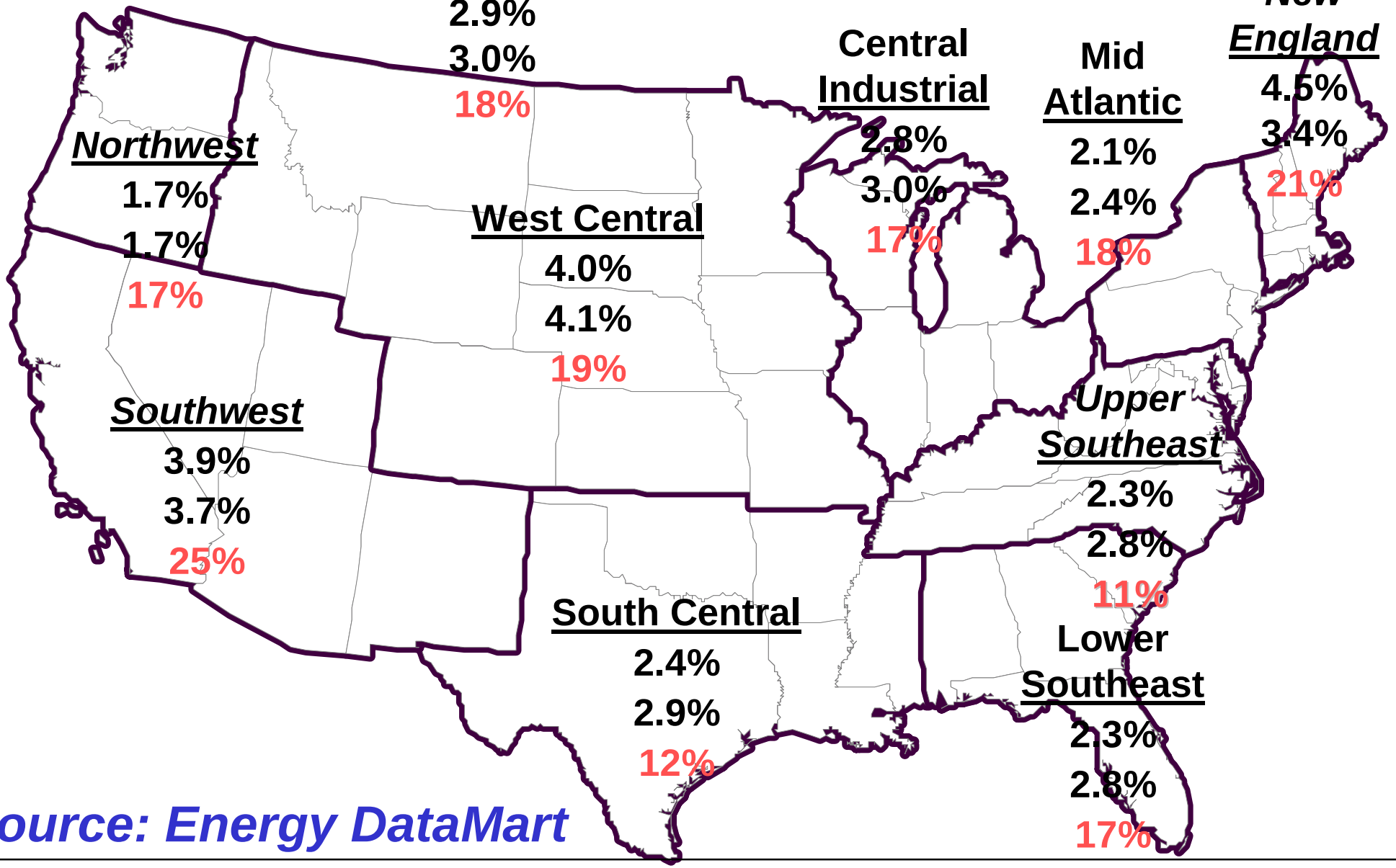
DG Market Opportunity



Source: Columbia

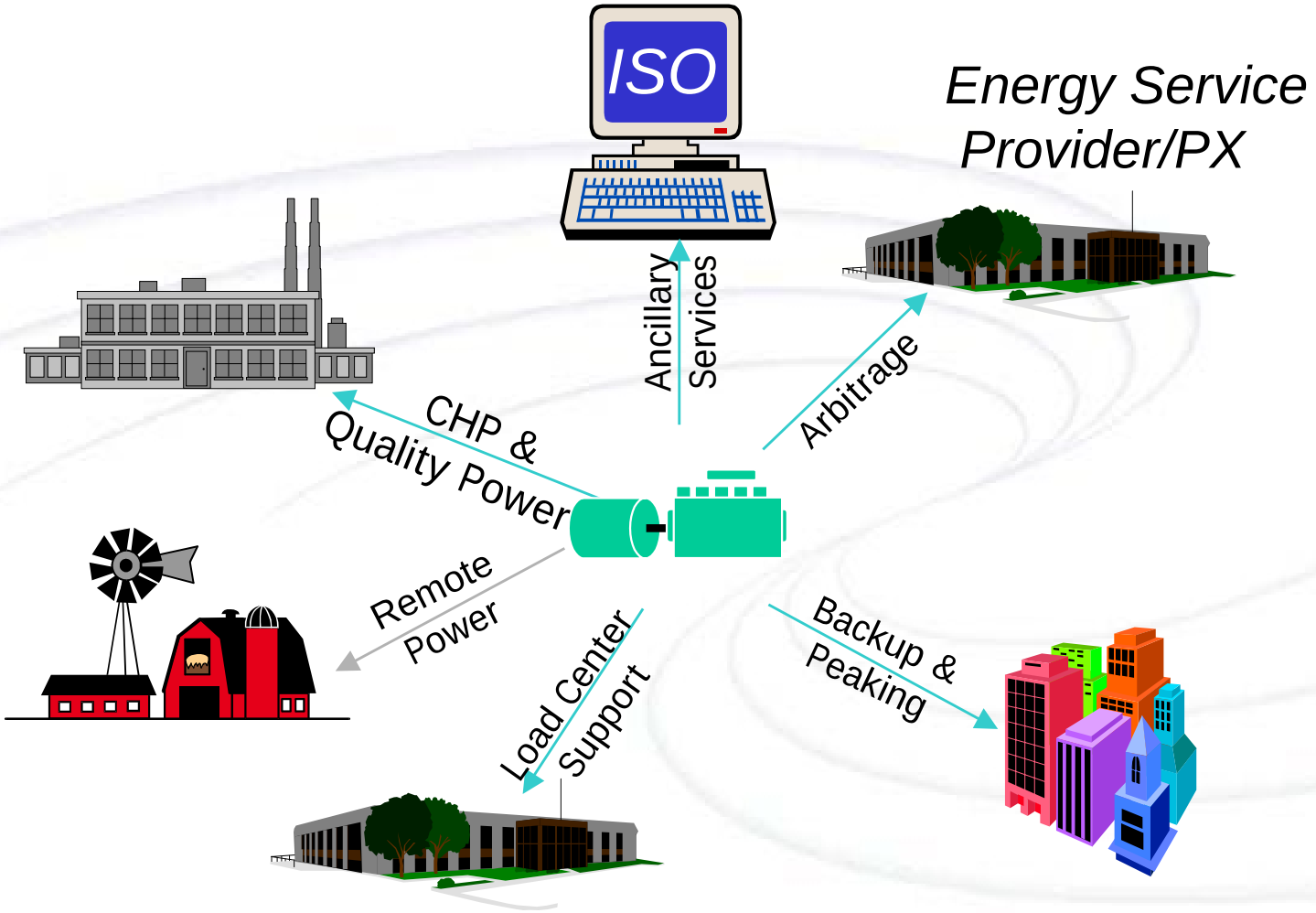
Energy Data Mart DG Sample:
Regional Distributions On-site Generation

(* % of Est; * % by Size; * % Very Likely to be Interested)



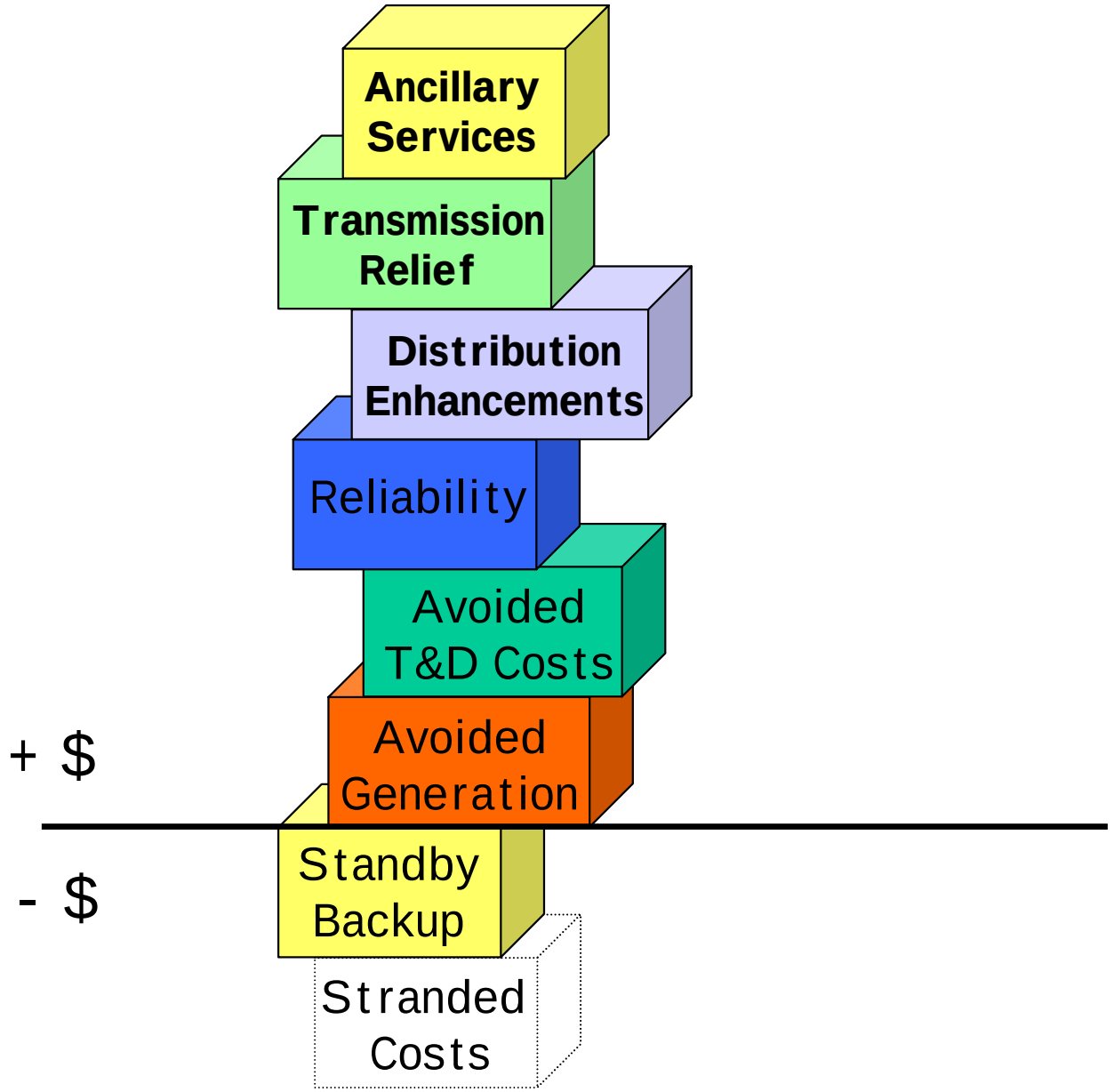
Source: Energy DataMart

CHP Applications



ONSITE SYCOM Energy Corporation

CHP Economic Benefits



CHP Barriers

- Deferral rates and practices by utilities
- High standby/back-up power costs
- Overly strict interconnect requirements and high costs
- Stranded Cost recovery on kWh generated
- Environmental benefits not recognized
- Siting and permitting delays/uncertainties
- Non-core customer investment

ONSITE SYCOM Energy Corporation

Overcoming the Barriers

- Federal government recognizing the environmental and efficiency benefits of CHP
- State restructuring legislation becoming more favorable to on-site generation
- Stakeholders organizing to support DG agenda

ONSITE SYCOM Energy Corporation

Niche Markets

Until electricity markets are properly restructured to enable DG, niche markets will evolve…..

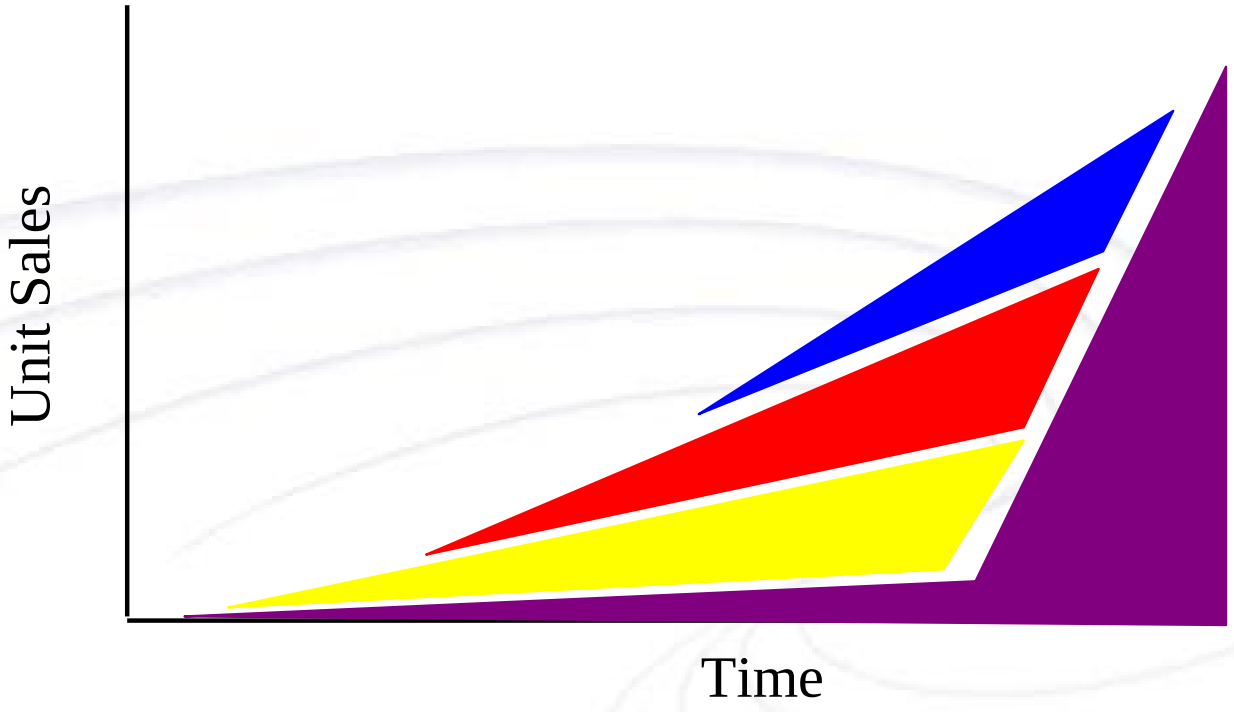
ONSITE SYCOM Energy Corporation

Distributed Generation Market Niches

- Tecogen turns to *mechanical drive products* to avoid utility barriers
- Sure power uses ONSI fuel cell to provide *ultra-reliable, premium power* to Omaha First National Bank
- Many customers can now choose between buying *standby equipment or standby service*
- Williams offers *remote generation* at well-sites
- Several utilities installing *modular generators at substations* to defer distribution system upgrades and meet generation reserve requirements
- Good industrial and commercial *combined heat and power* projects continue to be implemented world wide
- Commercial and industrial customers are utilizing onsite generation for *peak shaving* to reduce energy costs
- Several companies are looking to *aggregate capacity from onsite emergency generators*

ONSITE SYCOM Energy Corporation

Likely Projection for DG



DG will offer a new value proposition in new and unexpected niches. Performance improvements are made, production costs are reduced due to volume, business transactions are more efficient, regulatory changes are made, and DG eventually finds wide market acceptance

ONSITE SYCOM Energy Corporation

Conclusions

- Economic and Environmental Fundamentals Favor CHP
- Utility Resistance and Regulatory Roadblocks Hinder Widespread Implementation
- Federal and State Initiatives Beginning to Recognize CHP Benefits and Addressing Barriers
- Niche Markets Evolving Around Specific CHP/DG Features
- ESCOs & ESPs Opening Alternative Paths to Market
- Once Enabling Market Drivers Adequately Evolve, CHP/DG Implementation will be Robust

ONSITE SYCOM Energy Corporation